

May 5, 2006

Mr. Dwight E. Sanders
California State Lands Commission
Division of Environmental Planning and Management
100 Howe Avenue, Suite 100-South
Sacramento, CA 95825-8202

Re: State Clearinghouse Number 2004021107
Cabrillo Port Liquefied Natural Gas Deepwater Port Project
Revised Draft Environmental Impact Report Comments

I. Introduction

I have reviewed and prepared comments on the Cabrillo Port, Liquefied Natural Gas Deepwater Port Project, Revised Draft Environmental Impact Report (Revised DEIR), dated March 2006. In particular, I focused on the construction, operation, marine vessel, and Project-associated emissions of ozone precursor pollutants that will impact coastal California air quality.

The Revised DEIR fails to recognize a very simple premise: Ventura County and the South Coast Air Basin are nonattainment for ozone, and all Project NO_x and ROC emissions, whether offshore or onshore, will have a significant impact on this already unacceptable situation. Instead, the Revised DEIR tries to divide the Project operational and construction emissions among several impact classifications, thus taking a piecemeal approach to significance determinations and mitigation requirements. Predictably, this convoluted and unjustifiable methodology is not protective of onshore air quality impacts or the public health.

In addition, the Revised DEIR relies on several flawed assumptions that lead to underestimating Project operation and construction emissions. In these instances (discussed below), both the impacts and required mitigation are understated.

Summaries of my Revised DEIR comments are as follows:

- Emissions from all offshore sources will significantly impact onshore air quality, which is nonattainment for ozone (Comment III);
- The determination that Anacapa Island is in attainment for the Federal ozone standard is irrelevant, and based on flawed analyses of the existing data. The shaky interpretation of Anacapa ozone attainment status is the cornerstone for exempting the Project from binding and verifiable mitigation requirements (Comment IV);
- The Project construction emissions are likely underestimated due to optimistic schedules, equipment size, equipment rating, and equipment usage (Comment V);
- The Revised DEIR relies on incorrect Project FSRU emissions (Comment VI);
- The Revised DEIR does not evaluate or mitigate Project startup emissions, even though they are significant (Comment VII);

- The Revised DEIR fails to calculate Project LNG carrier emissions for California Coastal Waters (Comment VIII);
- The Revised DEIR identifies (but does not assess) the increased emissions caused by potentially higher heating value gas supplied by the Project (Comment IX);
- The Project operational and construction emissions are divided among three adjacent and different ozone attainment/nonattainment planning areas. The Revised DEIR never considers the sum total effects of all the Project emissions (Comment X);
- Onshore construction emissions result in Class I air impacts (Impact AIR-1), which are not mitigated to Class II by requiring offsets (Comment XI);
- Project FSRU and associated marine vessel emissions are incorrectly divided into two separate air impact findings (Impacts AIR-4 and AIR-5). These Project components must be considered together with the total emissions mitigated to insignificance (Comment XII);
- Project construction emissions in Federal waters significantly impact onshore nonattainment air quality and must be mitigated to insignificance (Comment XIII).

II. Qualifications

My comments on the Revised DEIR, presented below, are based on over 25 years of professional experience performing air quality and toxics exposure analyses. I was the senior air quality modeler and air toxics program coordinator for the Santa Barbara County Air Pollution Control District (SBAPCD), where I worked for approximately nine years. At the SBAPCD, I was also responsible for air quality modeling analyses used for determining the effectiveness of NO_x and VOC control measures on ozone formation, and the resultant process of attaining ozone standards as part of the Santa Barbara County's Air Quality Attainment Plan (AQAP). I also managed the EIR process for the District's AQAP, and I participated in several extensive meteorological analyses in the Santa Barbara Channel.

I am experienced in calculating emissions from offshore sources, including marine vessels. I have performed many air dispersion modeling analyses to determine the onshore impacts from these offshore emissions, and I reviewed and commented on beta-versions of the Minerals Management Service OCD model. As the first regulatory agency user of OCD, I developed detailed instructions for applying the model, as well as for OCDCPM, a hybrid version of OCD that was used in Santa Barbara County for permitting many offshore and coastal sources of air emissions.¹ I sited approximately 30 meteorological and air quality monitoring stations throughout Santa Barbara County, with many of them positioned specifically to track onshore impacts from offshore platform and marine vessel emissions. I also maintained a meteorological monitoring station on Platform Hondo, giving me a unique perspective on winds in the offshore environment.

While at the SBAPCD, I co-developed the mathematical, computer-based model for predicting community exposures to toxic air pollutants that was distributed by CAPCOA, the California Air Pollution Control Officers' Association. These measurements of exposure are often called Health

¹ Santa Barbara County Air Pollution Control District, Authority to Construct Permit Processing Manual, Section 6.0, Air Quality Impact Analysis, October 20, 1987.

Risk Assessments. CAPCOA is a voluntary association of state and local government officials, largely engineers and scientists responsible for air pollution control in California. The computer model I co-developed (ACE2588) has been used by air districts throughout the state in evaluating AB 2588 submissions by facilities covered by the law, and used extensively by consultants who prepared AB 2588 submissions for the facilities. I provided technical support on using this model for over 10 years, until it was replaced with the California Air Resources Board (CARB) program, HARP. Recipients of this support included regulatory agencies, industrial sources, and consulting firms.

For the past 14 years I have been a private consultant, specializing in regulatory agency and litigation support. My clients include the California Attorney General's Office, the Los Angeles County District Attorney's Office, the California Office of Environmental Health Hazard Assessment, various air pollution control agencies, the California Air Pollution Control Officer's Association, and many private firms. I have prepared over 300 complete air toxics health risk assessments and over 1,000 air dispersion modeling analyses. I have successfully provided expert testimony in numerous Federal and State Court cases. My curriculum vitae is attached.

Following are my comments on the Revised DEIR.

III. Emissions from all Offshore Sources will Significantly Impact Onshore Air Quality, Which is Nonattainment for Ozone

Re: Section 4.6.1.2 Existing Air Quality

All Project offshore emissions will have an adverse impact on onshore air quality and must be meaningfully addressed in the Revised DEIR. Ozone is a regional pollutant – it is not restricted to the limited area in which it is emitted. The entire ozone regulatory framework is guided by this exceedingly clear principle. The effectiveness of control measures and emission reduction strategies are analyzed in regional, Eulerian photochemical models; The requirements for project offsets are expanded to the entire county or air basin in question; Emission inventories are calculated for these same geographical impact areas.²

The Revised DEIR disregards the well-established knowledge that offshore emissions will come onshore, and that they contribute as much as onshore pollutant sources to the ozone nonattainment problem.

In essence, the Revised DEIR divides the offshore Project operational and construction emissions among several impact classifications, each with their own, non-overlapping requirements. The Revised DEIR does not consider the collective effects of the total Project emissions – in other words, the full impacts of ozone precursor emissions are ignored.

² Tesche, T.W. and McNally, D.E., May 1991. Photochemical Modeling of Two 1984 SCCAMP Ozone Episodes. *Journal of Applied Meteorology*, 30,5,745-763.

There are many dozens of published and peer-reviewed accounts demonstrating that offshore emissions in the Project area are part of the onshore ozone nonattainment problem. Even 50 years ago, the *Southland Weather Handbook* presented wind streamlines showing that emissions from the Project location come directly onshore.³ From this publication:

The main onshore flow of sea air fans out from Santa Monica to below San Diego, reaching the coast from west-southwest in Santa Monica Bay and from the west-northwest in San Diego County. Islands and hills cause minor variations in the larger pattern, such as the deflecting influence of the Palos Verdes Hills. On the coast northwest of Santa Monica to Santa Barbara the sea air reaches the coast from a more southerly quarter.⁴

Many more sophisticated meteorological analyses have been prepared as part of ozone studies and SIP modeling applications for the South Coast and South Central Coast Air Basins. These analyses focus on the meteorological conditions and trajectories associated with elevated ozone concentrations; however, the general onshore flow patterns are also presented. A few examples of these studies include:

- Various early (1981 and previous) tracer gas releases from offshore and nearshore locations to track onshore impacts and land/sea air recirculation.^{5,6} These tracer gas studies included an offshore release along the coast from Long Beach to Ventura. In all the studied tracer releases, the offshore emissions were found to be advected onshore.
- The South Central Coast Cooperative Aerometric Monitoring Program (SCCCAMP).^{7,8} The SCCCAMP study was performed to develop modeling data for ozone attainment planning analyses in Santa Barbara and Ventura Counties. The mesoscale meteorological patterns observed during SCCCAMP demonstrate the strong onshore patterns in the Project area, as well as the land-sea breeze interaction. These wind flows couple the onshore and offshore areas such that they cannot be analyzed separately (as is being done in the Revised DEIR).
- The Southern California Air Quality Study (SCAQS).⁹ This extensive study analyzed meteorological conditions, emissions, and pollutant formation (including ozone) from Ventura County through the South Coast Air Basin.

³ Aldrich, John H. and Myra Meadows. *Southland Weather Handbook*, 1956.

⁴ Ibid, p.6.

⁵ Shair, F.H., Application of Atmospheric Tracer Techniques to Determine the Transport and Dispersion Associated with the Land-Breeze Movement of Air Over the Los Angeles Coastal Zone, California Institute of Technology, prepared for CARB, December 2, 1982. The entire report can be downloaded from CARB at:
<http://www.arb.ca.gov/research/apr/past/atmospheric.htm>.

⁶ Shair, F.H., et al., Application Transport and Dispersion of Airborne Pollutants Associated with the Land Breeze-Sea Breeze System, October 1981.

⁷ Hanna, Steven R., May 1991. Characteristics of Ozone Episodes during SCCCAMP. *Journal of Applied Meteorology*, 30,5,534-550.

⁸ Douglas, Sharon G. and Kessler, Robert C., May 1991. Analysis of Mesoscale Air Patterns in the South-Central Coast Air Basin during the SCCCAMP 1985 Intensive Measurement Periods. *Journal of Applied Meteorology*, 30,5,607-631.

⁹ Blumenthal, D.L., Watson, J.G., and Roberts, P.T. 1987. Southern California Air Quality Study (SCAQS) Program Plan, Sonoma Technology Inc. Report to the California Air Resources Board, June 1987.

- The 1997 Southern California Ozone Study (SCOS97-NARSTRO).¹⁰ The SCOS97 - NARSTO meteorological network collected data from June 16 through October 15, 1997. Emissions, meteorological, and air quality data were assessed for five different types of multi-day ozone episodes. The interrelated nature of offshore emissions and onshore air impacts is studied and documented.
- Air Quality Impacts from NO_x Emissions of Two Potential Marine Vessel Control Strategies in the South Coast Air Basin.¹¹ As part of SCOS97, tracer gases were released from two shipping lanes near the Project area – the current lane and a proposed lane farther from shore. The tracer gases were monitored onshore, and the results showed that both shipping lane releases impacted onshore air quality. Moving the emissions farther offshore did not always benefit onshore air quality, and in one test had a “disbenefit.”¹²
- Analysis of Aerometric and Meteorological Data for the Ventura County Region.¹³ This report describes the various trajectories that carry pollutants into Ventura County, including several emanating from offshore areas.
- The Structure and Variability of the Marine Atmosphere around the Santa Barbara Channel.¹⁴ This paper studies the mesoscale meteorological conditions between Pt. Arguello and the Santa Monica Basin. The mean wind flow in the Santa Barbara Channel is shown to be strongly onshore, including the winds in the proposed Project area.

All of these studies, and many others, can be referenced to show that the emissions and air flow at the Project location contribute to the onshore ozone nonattainment problem. There is no meteorological or air quality basis for the Revised DEIR to exclude any Project emissions from emission reduction requirements. Every study points to the opposite conclusion, including the Revised DEIR itself.

Even BHP Billiton’s meteorological data and air quality modeling, which are presented in the Revised DEIR, hurts, rather than helps, the argument for excluding any offshore emissions from mitigation requirements. The Revised DEIR includes modeling with the Offshore and Coastal Dispersion (OCD) model, which uses five years of meteorological data collected from one onshore (Oxnard Airport) and one offshore (Buoy Station 46025 – Santa Monica Basin) site (Revised DEIR, Appendix G7).¹⁵ These data are for the years 2000 through 2004. While these meteorological data stations were not established with air dispersion modeling in mind (airports and ocean buoys do not generally collect high-quality meteorological data, and are not site-specific), the general wind flow

¹⁰ Fujita, Eric M., et al., February 1999. SCOS97-NARSTRO 1997 Southern California Ozone Study and Aerosol Study, Volume III, Summary of Field Study. Desert Research Institute, prepared for CARB. 1998 AWMA papers available online at: http://www.arb.ca.gov/research/scos/awma_98/awma_98.htm; Publications available online at: <http://www.arb.ca.gov/research/scos/scospub.htm>.

¹¹ SCAQMD, and CARB, Air Quality Impacts from NO_x Emissions of Two Potential Marine Vessel Control Strategies in the South Coast Air Basin, Final Report, September 2000.

¹² Ibid., p. 44.

¹³ Blumenthal, D.L., Smith T.B., Lehrman, D.E. et al., 1986. Analysis of Aerometric and Meteorological Data for the Ventura County Region, Sonoma Technology Inc. Report to the Western Oil and Gas Association, June 1986.

¹⁴ Dorman, C.E. and Winant, C.D., February 2000. The Structure and Variability of the Marine Atmosphere around the Santa Barbara Channel. Monthly Weather Review, 128, 261-282.

¹⁵ Sierra Research CEQA Air Quality Assessment.

patterns should be adequately characterized by these data. A frequency analysis of the wind speeds and direction (direction from which the wind is blowing) for the Santa Monica Basin Buoy data is presented in the following table.

Wind Frequency Distribution for: Santa Monica Basin Buoy (46025)							
Period of meteorological data set data: 1/1/2000 - 12/31/2004							
Wind Direction Sector (Degrees)	Downwind Area Impacted by this Wind Sector	% Non-Calm Hours	% from 0.1 – 3.0 m/s	% from 3 - 5 m/s	% from 5 - 10 m/s	% > 10 m/s	Average WS (m/s)
N: 348.75 - 11.25	Offshore	3.59	2.22	1.03	0.33	0.01	2.72
NNE: 11.25 - 33.75	San Nicolas Is.	2.55	1.64	0.55	0.30	0.05	2.87
NE: 33.75 - 56.25	Offshore	2.57	1.68	0.47	0.35	0.06	2.91
ENE: 56.25 - 78.75	Offshore	3.22	1.80	0.81	0.52	0.09	3.24
E: 78.75 - 101.25	SB Co. – Channel Is.	4.24	2.32	1.37	0.49	0.06	3.05
ESE: 101.25 - 123.75	SB Co.	4.47	2.47	1.37	0.53	0.10	3.17
SE: 123.75 - 146.25	Ven. Co. & SB Co.	4.54	2.65	1.37	0.46	0.07	2.98
SSE: 146.25 - 168.75	Ven. Co. – Ventura	3.80	2.58	0.89	0.30	0.02	2.57
S: 168.75 - 191.25	Ven. Co. – Pt. Mugu	3.49	2.52	0.68	0.26	0.03	2.49
SSW: 191.25 - 213.75	Ven. Co. – SE Coast	3.61	2.69	0.70	0.20	0.01	2.38
SW: 213.75 - 236.25	LA Co. – SW Coast	5.24	3.58	1.41	0.24	0.02	2.50
WSW: 236.25 - 258.75	LA Co. - Malibu	9.12	4.25	3.59	1.28	0.01	3.23
W: 258.75 - 281.25	LA Co. – Santa Monica	20.84	6.06	7.49	6.59	0.71	4.42
WNW: 281.25 - 303.75	LA Co. – Long Beach	12.15	4.04	4.14	3.05	0.93	4.55
NW: 303.75 - 326.25	LA Co. - Catalina	10.00	3.80	3.53	2.56	0.12	3.86
NNW: 326.25 - 348.75	Offshore	6.04	2.93	2.15	0.95	0.01	3.24
Totals:		99.45	47.20	31.54	18.41	2.30	
Total number of hours in meteorological data set: 43,848							
Number of calm hours: 242 (wind speeds less than 0.1 m/s)							
Period Ave. Wind Speed: 3.53 m/s							
Calm hours are not included in average wind speeds.							

Wind directions from each of the 16 cardinal compass points are shown in the above table, along with the percentage of winds that emanate from each of the 22.5 degree sectors centered on that direction. The frequency of winds, by wind speed category and for all hours, is listed for each of these sectors. Also shown is the representative downwind area impacted by the winds from each sector.

The predominant winds measured at the Santa Monica Basin Buoy are from the west/southwest to northwest, which directly impact Los Angeles County. This table shows that roughly 57 percent of the Santa Monica Basin Buoy winds blow ashore in Los Angeles County. Winds blow towards Ventura County about 15 percent of the time, and to Santa Barbara County with somewhat less than 10 percent frequency. Offshore winds (not blowing directly towards California) are measured about

18 percent of the time. In essence, emissions from the Project area will blow onshore roughly 80 percent of the time.

This finding is consistent with CARB's analysis of offshore emissions and the potential for these emissions to affect onshore air quality. CARB analyzed the prevailing wind direction, by month, at a number of coastal sites in central and southern California. For stations near the proposed Project, the prevailing wind direction (direction with the highest percent of frequency) blows onshore every month of the year at Santa Barbara, 11 months of the year in Oxnard, nine months of the year at Pt. Mugu Naval Air Station, and 11 months of the year at Santa Monica.¹⁶ These results are supported by tracer studies, modeling exercises, and other analyses considered by CARB.

The modeling impacts from offshore Project sources (using the Santa Monica Basin Buoy data) are shown graphically in Figures 1-1 through 1-16 of the Revised DEIR, Air Quality Appendix G7. Each of these figures show that the proposed Project and marine vessels will increase onshore air concentrations of criteria air pollutants in Ventura and Los Angeles County, including the ozone precursor, NO₂. This is a direct product of the prevailing winds on the Project area, which transport the offshore emissions onto onshore areas.

BHP Billiton, however, does not present any photochemical modeling for ozone formation potential. Rather, the air quality assessment (Revised DEIR Appendix G7, Section 2.1.2) attempts to use the Gaussian OCD modeling approach to support the conclusion that "the unique attributes of the proposed Project demonstrate that there is insignificant potential for the proposed Project to impact the onshore ozone nonattainment area." BHP Billiton does not provide any documentation, peer-reviewed, published, or otherwise, to support their unique method of characterizing ozone impacts from Gaussian dispersion modeling – a method that does not consider photochemical reactions and other parameters necessary to assess ozone impacts. Ozone formation from NO_x and VOC emissions is not linear – BHP Billiton has not shown in any meaningful way that onshore ozone impacts caused by Project emissions will be insignificant.

Contrary to the conclusions of Air Quality Appendix G7 (BHP Billiton's "Air Quality Assessment"), the Revised DEIR correctly determines that Project NO_x emissions will significantly impact onshore ozone concentrations (Impacts AIR-4 and AIR-5). It appears that the Revised DEIR did not rely on Air Quality Appendix G7 in reaching these significance determinations.

The offshore Project emissions will greatly exceed the Ventura County Air Pollution Control District (VCAPCD) and the South Coast Air Quality Management District (SCAQMD) significance thresholds (see Comment XII below). By this standard alone, the offshore Project emissions will be significant. And although the Project emissions are being released offshore, as explained above, this does not counter the likelihood for causing significant onshore ozone impacts. In addition, for a source with greater NO_x emissions (relative to VOC), the highest ozone contribution often occurs at

¹⁶ California Air Resources Board, Staff Report: Initial Statement of Reasons for Proposed Rulemaking. Proposed Regulation for Auxiliary Diesel-Electric Engines Operated on Ocean-Going Vessels Within California Waters and 24 Nautical Miles of the California Baseline. October 2005. Appendix F: Offshore Emissions Impacts on Onshore Air Quality.

greater downwind distances, compared to culpable ozone levels in the near-field areas. In other words, distance alone does not mitigate Ventura and Los Angeles County ozone impacts caused by the Project offshore NO_x emissions.

And sometimes the simplest observation is the most telling: The BHP Billiton methodology for assessing the significance of potential ozone impacts is never used in regulatory ozone attainment analyses. Nonattainment area modeling is complex, and requires detailed studies of three-dimensional meteorological parameters, initial and boundary conditions, photochemistry, regional emission inventories, and other inputs.¹⁷ If the VCAPCD and the SCAQMD applied the flawed BHP Billiton reasoning to their ozone planning and permitting process (which they do not), no source would be culpable for contributing to the ozone nonattainment problem, and no progress at attaining (or at least maintaining) clean air standards would be possible.

Regulatory agencies have long recognized the need to address, reduce, and mitigate (offset) NO_x emissions from offshore sources, including marine vessels. CARB specifically developed a definition of California Coastal Waters for this purpose, described as “the area offshore of California within which pollutants are likely to be transported ashore and affect air quality in California’s coastal air basins, particularly during the summer.”¹⁸ The SCAQMD, with CARB, prepared analyses of potential emission control strategies for marine vessels off of Southern California – the goal being to reduce onshore ozone impacts from these offshore emissions.¹⁹ And the Santa Barbara County APCD has stated the problem very clearly: “Marine shipping, the largest unregulated source of oxides of nitrogen (NO_x) emissions, remains a significant long-term obstacle to achieving ozone standards in coastal areas, as documented in the example of Santa Barbara County in California.”²⁰ The Revised DEIR, by separating offshore activities into several impact classifications, is attempting to circumvent the obvious need to treat all Project emissions equally. All Project ozone precursor emissions, offshore or onshore, operation or construction, will significantly impact onshore ozone concentrations and must be mitigated to insignificance.

IV. The Determination that Anacapa Island is in Attainment for the Federal Ozone Standard is Irrelevant, and Based on Flawed Analyses of the Existing Data

Re: Section 4.6.1.2 Existing Air Quality

Table 4.6-2 of the Revised DEIR shows the Federal air quality area designations for Ventura and Los Angeles counties. For Ventura County, there are two areas for designation: the mainland portion, and the Channel Islands, which include Anacapa and San Nicolas islands. Table 4.6-2 shows that the Channel Islands are in Federal attainment status for all criteria pollutants, except SO₂, which is

¹⁷ Tesche, T.W. and McNally, D.E., May 1991. Photochemical Modeling of Two 1984 SCCAMP Ozone Episodes. *Journal of Applied Meteorology*, 30,5,745-763.

¹⁸ California Air Resources Board, Report to the California Legislature on Air Emissions from Marine Vessels, Volume I, June 1984, p.78.

¹⁹ SCAQMD, and CARB, Air Quality Impacts from NO_x Emissions of Two Potential Marine Vessel Control Strategies in the South Coast Air Basin, Final Report, September 2000.

²⁰ Murphy, T.M., Santa Barbara County APCD, The Need to Reduce Marine Shipping Emissions – A Santa Barbara County Case Study, AWMA paper, 2003.

unclassified due to lack of data. Table 4.6-2, however, is incorrect. The Federal designation for the Channel Islands portion of Ventura County is unclassifiable/attainment for all pollutants, including the one-hour and eight-hour ozone standards.²¹

The history behind the Federal ozone attainment status for Anacapa Island is murky at best. From 1991 through 1994, the VCAPCD used the EPA designation that all of Ventura County is nonattainment for ozone.²² This was based on the November 6, 1991 Federal Register, page 56731, which listed all of Ventura County as the Ventura County nonattainment area. To confuse the matter, on the next page (56732) the Federal register designated the South Central Coast (remainder of), Channel Islands, as unclassifiable/attainment, even though Anacapa and San Nicolas Islands are part of Ventura County.²³ On December 5, 1996, at the request from the US Navy, the EPA wrote to the VCAPCD that Anacapa and San Nicolas Islands are not part of the Ventura County nonattainment area.²⁴ This letter also references that the VCAPCD Board specifically exempted San Nicolas Island from the AQMP requirements, pending a formal determination from EPA.

That Mainland Ventura County should be nonattainment for ozone and that San Nicolas Island (which is over 50 miles further offshore than Anacapa, and has no historical air quality data) should be attainment/unclassified seems clear. Caught in the middle of this uncertainty, however, is Anacapa Island. Anacapa is relatively near to the mainland – the closest of the Channel Islands, at about 14 miles from shore. Anacapa also has multiple years of air quality data, including ozone measurements.

Hourly ozone readings were collected on Anacapa Island from 1985 through 1992. The percent of data coverage, however, was less than desirable. For example, in 1989 and 1990, only four and two percent coverage during typical periods of high concentration were achieved, respectively. The best year for data collection was 1992, with 82 percent coverage during typical periods of high concentration. The average collection efficiency over the years 1985 through 1992 was only 48.5 percent.²⁵ The air quality monitoring effort at Anacapa Island ended in 1992.

Despite the short duration monitoring program and the relatively low number of hours of ozone data actually collected, Anacapa Island experienced a number of concentrations exceeding the State and Federal ozone standards. In 1988, 1991, and 1992 (the last three years with any meaningful data), there were six, three, and four days, respectively, exceeding the State one-hour ozone standard of $0.09 \mu\text{g}/\text{m}^3$. These three years also had four, three, and three days, respectively, exceeding the Federal eight-hour ozone standard of $0.08 \mu\text{g}/\text{m}^3$. The actual number of days exceeding ozone standards would have been significantly higher if the air pollution regulatory agencies (EPA, CARB, and VCAPCD) rounded up based on the third significant figure, rather than down. Thus, in regulatory algebra, an eight-hour average ozone concentration of $0.084 \mu\text{g}/\text{m}^3$ does not exceed the

²¹ 40CFR 81.305.

²² Letter from Richard Baldwin, VCAPCD, to David P. Howekamp, EPA Region IX, December 1, 1994.

²³ Ibid.

²⁴ Letter from David P. Howekamp, EPA Region IX to Richard Baldwin, VCAPCD, December 5, 1996.

²⁵ CARB Air Quality Data CD Vol. 1.

NAAQS of $0.08 \mu\text{g}/\text{m}^3$. While this makes it easier for the regulatory agencies to demonstrate attainment, it is not a health-protective practice in any sense whatsoever.

An even easier method to “demonstrate” attainment is to just stop measuring any and all air quality data in a particular area. This is apparently what happened on Anacapa Island when the ozone monitoring station was removed, even though ozone concentrations exceeding State and Federal standards were measured on October 13, 1992 – only 18 days before the last data were collected. In a somewhat confusing set of correspondence between the VCAPCD, EPA, and the US Navy, the Federal ozone status for Anacapa became “attainment,” despite contradictory existing ozone measurements, the relatively short distance to the rest of the Ventura County nonattainment area, and the CARB designation for Anacapa as nonattainment for State ozone standards.

Emissions from the Project FSRU, marine vessels, and construction activities will impact onshore ozone nonattainment areas in Ventura and Los Angeles counties. CEQA requires the State Lands Commission (SLC) to mitigate to insignificance all Project associated emissions – this has not been done in the Revised DEIR. As discussed in Comment III above, offshore NO_x and ROC emissions are transported onshore, where they undergo photochemical reactions to form ozone. In fact, for a source with greater NO_x emissions (relative to ROC), the highest ozone contribution often occurs at greater downwind distances, compared to culpable ozone levels in the near-field areas. This is because time is needed for these photochemical reactions to occur, and with time the pollutants are advected downstream (and onshore) with the prevailing wind fields. This was demonstrated many times by the Santa Barbara County Air Pollution Control District in their Lagrangian photochemical modeling analyses of potential onshore ozone impacts from offshore oil development NO_x and ROC emissions.²⁶

From a geographical standpoint, the proposed Project is 21.4 miles from Anacapa Island, but only 13.8 miles from the nearest mainland landfall (Revised DEIR, Figure 2.1-2).²⁷ Yet, the proposed Project is accepted by the Revised DEIR to be in the same air quality designation area as Anacapa Island. Interestingly, the closest mainland point to the FSRU is only about 0.4 miles west of the Los Angeles/Ventura County line.²⁸ Based on distance alone, the Project should be considered part of the onshore nonattainment areas, and not the unclassified/attainment designation for Anacapa Island.

There is no question – the Revised DEIR is assisting the applicant in cherry-picking the Federal ozone attainment status that best suits its purpose. Of the three possible options – serious nonattainment within the SCAQMD, moderate nonattainment within the onshore portions of the VCAPCD, or a loophole-filled attainment status for Anacapa Island, the Revised DEIR sides with the least restrictive and most distant set of requirements. The Revised DEIR, however, must address and mitigate all potential significant Projects, regardless of whether a particular agency has proposed an exemption. The FSRU and associated marine vessel emissions will significantly contribute to

²⁶ For example, such modeling was prepared for the Exxon Santa Ynez Unit FEIS/R.

²⁷ 12.01 NM = 13.8 miles; 18.61 NM = 21.4 miles.

²⁸ Ibid. The analogy of placing a casino on the left side of a jurisdictional boundary, while gambling is illegal on the right side, is inescapable.

ambient ozone impacts in the areas located downwind of the Project, which if unmitigated, is a CEQA Class I impact.

From an air quality standpoint, there is no basis for attaching the proposed Project to the Federal ozone attainment designation for Anacapa Island. The issue at hand is whether the proposed Project will have a significant onshore air quality impact (it will) and how can this impact be mitigated (offsets of NO_x and ROC). The Revised DEIR must mitigate emissions to the maximum extent feasible, including verifiable offsets for all Project and Project-associated emissions. The favorable regulatory and permitting requirements identified in the Revised DEIR are not valid, and will only interfere with the VCAPCD and SCAQMD progress towards attaining and maintaining ambient air quality standards.

The Revised DEIR should specify that offsets, consistent with VCAPCD and SCAQMD NSR Rules, be required to mitigate the Project Class I impacts.

V. Emissions from Construction Activities are Optimistic and Unverifiable

Re: Section 4.6.1.3 Regulated Air Pollutant Emissions – Construction Activities

The Revised DEIR presents calculated emissions for each of the various construction phases. These emissions are presented (in tons for each activity) in the table below (from Revised DEIR, Table 4.6-11).

Construction Activity	Total Emissions (tons)					
	NO _x	SO ₂	CO	PM ₁₀	PM _{2.5}	ROC
<u>Federal Waters</u>						
Mooring/FSRU Installation	27.4	0.02	33.8	1.6	1.6	4.0
Offshore Pipeline Installation	82.4	0.06	101.5	4.8	4.8	11.9
Subtotal	109.8	0.08	135.3	6.4	6.4	15.9
<u>Ventura County</u>						
Offshore Pipeline Installation	14.5	0.010	17.9	0.8	0.8	2.1
Shore Crossing Construction	37.8	0.027	46.4	3.5	2.5	5.5
Onshore Pipeline Installation - Trenching	16.5	0.017	24.8	1.9	1.4	2.6
Onshore Pipeline Installation - Pipelay	11.5	0.066	57.0	8.0	2.6	3.0
Onshore Pipeline Installation - Boring	5.5	0.004	6.7	1.0	0.5	0.8
Worker Commuting	0.54	0.067	7.9	0.14	0.14	0.25
Subtotal	86.4	0.19	160.7	15.3	8.0	14.1
<u>Los Angeles County</u>						
Onshore Pipeline Installation - Trenching	8.3	0.0084	12.4	0.94	0.71	1.3
Onshore Pipeline Installation - Pipelay	5.8	0.033	28.5	4.0	1.3	1.5
Onshore Pipeline Installation - Drilling	13.0	0.0092	15.9	1.4	0.93	1.9
Worker Commuting	0.41	0.0514	6.1	0.11	0.11	0.19
Subtotal	27.4	0.10	62.9	6.5	3.0	4.8
TOTAL	224	0.37	359	28	17	35

There are many equipment, activity, and scheduling assumptions in the Revised DEIR that could underestimate construction NO_x emissions, including:

- A slight delay in Project schedule;
- Interferences with the Project schedule due to migrating marine mammals;
- An underestimation of the time required to complete each phase;
- An underestimation of the number of equipment needed to perform any task;
- An underestimation of the equipment size and horsepower to perform any task;
- An underestimation of the equipment load needed for the construction activities.

Based on my experience in calculating and modeling construction emissions, the Revised DEIR is relying on an optimistic schedule and emission inventory – for offshore as well as onshore (both Ventura and Los Angeles County) activities. For example, the entire onshore pipeline installation process allocates 180 activity days for trenching a distance of over 22 miles (combined Los Angeles and Ventura County onshore pipeline segments). The Revised DEIR does not provide any comparative studies or examples to support that this implementation schedule is realistic. All assumptions used are undocumented. Also, potentially lengthy delays from pipeline crossings at difficult points, such as Highways 1 and 101 in Ventura County are not discussed. Neither are problems that could be encountered with high water tables, which are likely to be found in southern Ventura County. Delays or underestimated activity days translate into additional construction emissions not accounted for in the Revised DEIR.

While it is helpful to identify what the expected emissions will be from construction, the Revised DEIR does not specify any enforceable emission-limiting conditions for these activities. We are asked to believe that construction scheduling, equipment size and number, and percent of operating power (load) will be as presented in the Revised DEIR.

Since it is nearly impossible to forecast the final and true construction schedule, the Revised DEIR must adopt mitigation requirements that limit the total emissions (in tons or tons per quarter) for each of the activities presented in Table 4.6-11. The only identified mitigation measure for these construction emissions, MM AIR-1a, fails to incorporate this necessary condition. Without this backstop, the applicant could continue to emit construction emissions well beyond those presented in the Revised DEIR with no regulatory consequences or meaningful mitigation requirements. I am providing additional input on the Revised DEIR-proposed construction mitigation measures and impact classifications (based on lbs/day emission thresholds) in Comments XI and XIII, below.

VI. The Revised DEIR Relies on Incorrect FSRU Emission Calculations

Re: Section 4.6.1.3 Regulated Air Pollutant Emissions – Stationary Operations

The emissions from the DF50 Wartsila main generator engines at the FSRU are based on an inappropriate emission factor. The Revised DEIR calculates NO_x emissions for these units using a NO_x emission concentration of 9 ppmv (gas mode).²⁹ This NO_x emission concentration is from Wartsila data, which is based on operating at 90 percent load.

²⁹ BHP Billiton, Minor New Source Review Construction Permit Application, Cabrillo Port, December 2005. Appendix E: FSRU Equipment Vendor Specifications; Wartsila Specification number 00470507-S504.

NO_x emission concentrations are not constant – they change as the engine load increases or decreases. The engine manufacturer, Wartsila, has emphasized this important point in many of its vendor specification sheets, including the DF50 engines proposed for use by BHP Billiton. For example, Wartsila footnotes their DF50 emission concentrations with the following warning: “Values at 90% load, not valid at other loads!”³⁰ The exclamation point is from Wartsila.

I attempted to obtain the Wartsila DF50 engine NO_x emission factors for loads other than 90 percent. I contacted Wartsila directly (on March 30, 2006), and asked for emission factors at other load levels, but I have not yet received a response.

This is very important, yet missing, information. While the emission factor is applicable to 90 percent loads, the main generator engines at the FSRU operate at an average load factor of only 51.2 percent (Revised DEIR, Appendix G2).³¹ BHP Billiton, however, applied the NO_x emission concentration for 90 percent loads – even though there is no evidence that it is any way applicable to the conditions at the FSRU. BHP Billiton must recalculate their Wartsila DF50 main generator engine NO_x emissions using data for loads of about 50 percent, and not the inappropriate 90 percent levels that they applied in the Revised DEIR. Since NO_x concentration usually increases as the load level decreases, the Project NO_x emissions are likely to be underestimated.

VII. The Revised DEIR Failed to Disclose Air Impacts from the Project LNG Carriers

Re: Section 4.6.1.3 Regulated Air Pollutant Emissions – Stationary Operations

The Revised DEIR assumes that LNG carriers making deliveries to the FSRU will have 60,000 horsepower engines. These engines are stated to run on 99% gasified LNG and 1% diesel fuel (by weight) as a pilot fuel (Revised DEIR, p. 4.6-15). The Revised DEIR, however, has not identified any LNG carriers that will be able to run on the combined gasified LNG and diesel fuels. Since BHP Billiton is assuming 130 berths per year at the FSRU, a significant number of these tankers will be needed. For the Revised DEIR to be credible, the fleet of dual-fueled LNG carriers must to be verified. In other words, the Revised DEIR has not demonstrated that such LNG carriers are available for the Project.

It is disconcerting that the Revised DEIR does not address any specifics regarding the proposed LNG carriers. Obviously, these tankers need to exist before the Project can proceed as described in the Revised DEIR. Also, had the tanker fleet been identified, specific engine sizes and pollutant information could be applied to the Project emission calculations. The Revised DEIR fails to provide specific information for either of these Project components.

Instead, the Revised DEIR calculates pollutant emissions for the LNG carriers using off-the-shelf USEPA emission factors. In this case, an emission factor is used to calculate the amount of air pollutants emitted by burning a given amount of fuel. For example, the Revised DEIR LNG carrier

³⁰ Ibid.

³¹ $110903 \text{ MW-hr} / (24.75 \text{ MW} * 8760 \text{ hr}) = 51.2\%$.

emission factor for NO_x is 0.847 lb per million BTU of gas burned. Because the heat content of the gas can be estimated, the emission factor can also be presented in units of grams of emissions per brake horse-power hour (g/bhp-hr). The Revised DEIR made this unit conversion, and, for example, the NO_x emission factor for the LNG carriers is 2.794 g/bhp-hr.

The emission factors for the Revised DEIR LNG carrier were obtained from the USEPA document for emission calculations, known as AP-42. Specifically, the Revised DEIR applied emission factors from the section for four-stroke lean-burn natural gas-fired engines, such as those used for gas compressors.³² This raises an obvious question: Why didn't the Revised DEIR apply emission factors for actual gasified LNG-fueled tanker engines that are proposed for the Project? If such LNG carriers exist in numbers sufficient to serve the 130 berthing visits to the FSRU, then surely they can be tested to develop engine-specific emission factors.

The Revised DEIR simply used inappropriate emission factors for calculating air emissions from the LNG carriers. The AP-42 four-stroke lean-burn natural gas-fired engine emission factors are derived from tests performed on stationary onshore engines, not LNG carriers or marine vessels of any kind. The AP-42 emission factors that were used in the Revised DEIR for calculating LNG carrier emissions apply to relatively small gas compressor engines, not extremely large tanker propulsion units.

Specifically, the AP-42 four-stroke lean-burn natural gas-fired engine emission factors are derived from 13 tests performed on gas compressor engines:

- 3 tests of engines at 736 hp;
- 6 tests of engines at 1100 hp;
- 1 test of an engine at 2000 hp;
- 2 tests of engines at 4200 hp;
- And 1 test of an unrated hp engine.

The average rating of the AP-42 tested compressor engines was about 1,600 horsepower. These engines are not representative of large marine vessel engines, and average only about 2.7 percent of the Project LNG carrier horsepower rating (60,000 hp). The AP-42 emission factors (and those used in the Revised DEIR) are in no way applicable to LNG carriers. The vast difference in engine type, size, and the intended applications (tankering vs. gas compressors) stretches the intended use of these factors beyond any reasonable limit. Further, the AP-42 four-stroke lean-burn natural gas-fired engine emission factors are derived from tests performed using natural gas, not a mix of 99% gasified LNG and 1% diesel fuel as proposed for the Project.

In no uncertain terms, the LNG carrier emissions are based on incorrect and inapplicable emission factors which make the Revised DEIR unreliable. This same concern applies to the Project tug emissions, which also use these inapplicable emission factors. The Revised DEIR should employ

³² USEPA, AP-42, Section 3.2, Natural Gas-Fired Reciprocating Engines, 7/00, Table 3.2-2.

emission rates obtained from source-tests or vendor specifications for the engines being proposed, rather than applying emission factors for a completely different class of engines.

In addition to using the wrong pollutant emission factors, the inventory of LNG carrier emissions is incomplete. The Revised DEIR did not include any generator or auxiliary boiler emissions from the LNG carriers, even though these are typical components of such marine vessels, regardless of the mode of operation (e.g., cruising, maneuvering, or hoteling).³³ Given that the Revised DEIR has not required the use of marine vessels that can operate without such auxiliary engines (i.e., diesel-electric propulsion), the potential emissions and the resultant onshore air quality impacts from LNG carriers are certainly underestimated.

The Revised DEIR also fails to include LNG carrier emissions from transit in California Coastal Waters. The Revised DEIR calculates emissions only within 25 nautical miles (NM) of shore, which substantially underestimates the Project emissions that will adversely affect onshore air quality. The extent to which the Project LNG carrier NO_x emissions are underestimated is presented in the following discussion and calculations.

The Revised DEIR developed an activity scenario for each LNG carrier berthing at the FSRU. Each berth was assumed to include LNG carrier activities within 25 NM of shore, and would last for 24 hours. For example, the LNG carrier was assumed to travel at 12 knots for 45 minutes (nine NM) while in the area from 16 to 25 NM from shore. And while in this mode, the LNG carrier engine was assumed to be operating at 47.5 percent load. The assumptions for this mode and the other activities used in calculating the LNG carrier emissions are presented in the following table:

Cabrillo Port LNG Carrier NO_x Emissions: Revised DEIR Calculations								
Berthing Activity	Miles	Speed (mph)	Time (hrs)	Percent Engine Load	Net BHP	Activity BHP-Hr	NO_x Emissions Each Berth (lb)	Annual NO_x Emissions (tons)
75 to 25 miles	--	--	--	--	--	--	--	--
25 to 16 miles	9.0	12	0.75	47.5%	28500	21375	131.7	8.56
16 to 13 miles	3.0	5	0.60	19.0%	11400	6840	42.1	2.74
Safety Zone	0.3	1	0.30	9.1%	5440	1632	10.1	0.65
Unload	0.0	stop	20.70	9.1%	5440	112608	693.6	45.09
Safety Zone	0.3	1	0.30	9.1%	5440	1632	10.1	0.65
13 to 16 miles	3.0	5	0.60	19.0%	11400	6840	42.1	2.74
16 to 25 miles	9.0	12	0.75	47.5%	28500	21375	131.7	8.56
25 to 75 miles	--	--	--	--	--	--	--	--
Totals:			24.0				1061.3	69.0

³³ SCAQMD, and CARB, Air Quality Impacts from NO_x Emissions of Two Potential Marine Vessel Control Strategies in the South Coast Air Basin, Final Report, September 2000, p.21. See also: California Air Resources Board, Staff Report: Initial Statement of Reasons for Proposed Rulemaking. Proposed Regulation for Auxiliary Diesel-Electric Engines Operated on Ocean-Going Vessels Within California Waters and 24 Nautical Miles of the California Baseline. October 2005, pp. III-5 – III-8.

Using these assumptions, the Revised DEIR calculates about 69 tons/year NO_x emissions from the 130 LNG carrier berths anticipated annually.³⁴ Besides the application of an inappropriate emission factor, other questionable assumptions are used for the LNG carriers. The engine load factors, a key component in the emission calculations, have not been documented in the Revised DEIR – they are simply BHP Billiton estimates. Such documentation is essential and should have been included in the Revised DEIR.

A key omission in the LNG carrier emission calculations is the Project contribution in the California Coastal Waters beyond 25 NM from shore. In the Project area, the CARB-defined California Coastal Waters extend to about 90 miles from the coast.³⁵ To be conservative, and because the point where the LNG carriers will enter California Coastal Waters is uncertain, I limited my analysis of emissions from to 75 NM from the mainland shore.

Beyond 25 NM from shore, marine vessels are in cruise mode, with a typical speed of about 15 knots.³⁶ In this mode, the engines run at about 80 percent load.³⁷ Using the same NO_x emission factor as the Revised DEIR (even though it is not appropriate), results in LNG carrier NO_x emissions within California Coastal Waters totaling 197.1 tons/year. This is an increase of about 128 tons/year NO_x over that identified in the Revised DEIR. These emission calculations are presented in the following table:

Cabrillo Port LNG Carrier NO_x Emissions: Revised DEIR Calculations, LNG Boil-Off Gas Used in CA Coastal Waters Beyond 25 NM								
Berthing Activity	Miles	Speed (kt)	Time (hrs)	Percent Engine Load	Net BHP	Activity BHP-Hr	NO_x Emissions Each Berth (lb)	Annual NO_x Emissions (tons)
75 to 25 miles	50.0	15	3.33	80.0%	48000	160000	985.6	64.06
25 to 16 miles	9.0	12	0.75	47.5%	28500	21375	131.7	8.56
16 to 13 miles	3.0	5	0.60	19.0%	11400	6840	42.1	2.74
Safety Zone	0.3	1	0.30	9.1%	5440	1632	10.1	0.65
Unload	0.0	stop	20.70	9.1%	5440	112608	693.6	45.09
Safety Zone	0.3	1	0.30	9.1%	5440	1632	10.1	0.65
13 to 16 miles	3.0	5	0.60	19.0%	11400	6840	42.1	2.74
16 to 25 miles	9.0	12	0.75	47.5%	28500	21375	131.7	8.56
25 to 75 miles	50.0	15	3.33	80.0%	48000	160000	985.6	64.06
Totals:			30.7				3032.5	197.1

³⁴ The Revised DEIR calculates 69.2 tons/year NO_x; the slight difference is due to rounding of load factors in the emission calculations.

³⁵ California Air Resources Board, Staff Report: Initial Statement of Reasons for Proposed Rulemaking. Proposed Regulation for Auxiliary Diesel-Electric Engines Operated on Ocean-Going Vessels Within California Waters and 24 Nautical Miles of the California Baseline. October 2005. Appendix F: Offshore Emissions Impacts on Onshore Air Quality, p. F-3.

³⁶ SCAQMD, and CARB, Air Quality Impacts from NO_x Emissions of Two Potential Marine Vessel Control Strategies in the South Coast Air Basin, Final Report, September 2000, p. 19.

³⁷ Ibid, p. 21.

The above emissions, however, are based on the Project LNG carriers using gasified LNG in all areas within California Coastal Waters. This is not what BHP Billiton is proposing to do.

Apparently, BHP Billiton intends to switch back and forth between diesel and gasified LNG as the carriers cross the boundary at 25 NM from shore. In other words, BHP Billiton is only committing to use gasified LNG for carrier activities within 25 NM from shore: "LNG carriers, tugboats, and the crew/supply boat would operate only with natural gas as the primary fuel while operating in State waters and Federal waters within 25 NM (29 miles or 46 km) of the coastline. (Revised DEIR, p. 4.6-16). Also, "By maintaining a specified amount of LNG in the LNG carrier cargo tanks after transfer operations, the LNG carrier would be able to operate on boil-off gas until it is beyond 25 NM (29 mile or 46 km) of the coast of California (Revised DEIR, pp. 4.6-15 - 4.6-16).

The NO_x emissions from the LNG carrier will increase substantially when it is operating on diesel fuel. If, for example, the LNG carriers were to use fuel oil in California Coastal Waters beyond 25 NM from shore, the annual NO_x emissions from LNG transfers would increase to 507 tons/year. This is an increase of about 438 tons/year NO_x that were not addressed or identified in the Revised DEIR. Since BHP Billiton has made no commitment to use boil-off gas for the full transit across California Coastal Waters, the Revised DEIR must recalculate the LNG carrier NO_x emissions using diesel fuel for travel beyond 25 NM from shore.

The LNG carrier emission calculations from using diesel fuel in California Coastal Waters beyond 25 NM from shore are presented in the following table. The NO_x emission factor for diesel fuel at 80 percent engine load is 9.553 g/bhp-hr, which is over three times greater than the value used in the Revised DEIR (2.794 g/bhp-hr).³⁸

Cabrillo Port LNG Carrier NO_x Emissions: Revised DEIR Calculations, Diesel Fuel Used in CA Coastal Waters Beyond 25 NM								
Berthing Activity	Miles	Speed (kt)	Time (hrs)	Percent Engine Load	Net BHP	Activity BHP-Hr	NO_x Emissions Each Berth (lb)	Annual NO_x Emissions (tons)
75 to 25 miles	50.0	15	3.33	80.0%	48000	160000	3369.6	219.02
25 to 16 miles	9.0	12	0.75	47.5%	28500	21375	131.7	8.56
16 to 13 miles	3.0	5	0.60	19.0%	11400	6840	42.1	2.74
Safety Zone	0.3	1	0.30	9.1%	5440	1632	10.1	0.65
Unload	0.0	stop	20.70	9.1%	5440	112608	693.6	45.09
Safety Zone	0.3	1	0.30	9.1%	5440	1632	10.1	0.65
13 to 16 miles	3.0	5	0.60	19.0%	11400	6840	42.1	2.74
16 to 25 miles	9.0	12	0.75	47.5%	28500	21375	131.7	8.56
25 to 75 miles	50.0	15	3.33	80.0%	48000	160000	3369.6	219.02
Totals:			30.7				7800.5	507.0

³⁸ Ibid, p. 20. CARB presents the diesel-fuel NO_x emission factor at 80% load as 12.81 g/kW-hr, which converts to 9.553 g/bhp-hr.

VIII. The Revised DEIR does not mitigate Project startup emissions

Re: Section 4.6.1.3 Regulated Air Pollutant Emissions – FSRU Start-Up Activities

The Revised DEIR calculates that there will be 42.3 tons/year of NO_x emissions from Project startup activities, and that these emissions would occur over about 60 days (Revised DEIR, pp. 4.6-16, 4.6-17). The startup emissions, however, are not addressed as contributing to any air impact, and no mitigation measures are identified in the Revised DEIR.

On a 24-hour basis, the Project startup emissions equal about 1,410 pounds of NO_x per day – a level that exceeds the daily emissions from the entire Project when in full operation (see Comment XII).³⁹ These emission rates can be compared to significance criteria for operational activities for both the VCAPCD and the SCAQMD. The significance threshold for operational NO_x emissions in the VCAPCD is 25 lbs/day (Revised DEIR, Table 4.6-16). The Project startup emissions exceed this significance threshold by a factor of 56.4. The significance threshold for operational NO_x emissions in the SCAQMD is 55 lbs/day.⁴⁰ The Project startup emissions exceed this significance threshold by a factor of 25.6. Clearly, the Project startup emissions should have been identified as contributing to significant impacts, and which will require mitigation to the maximum extent feasible.

The Revised DEIR, however, does not consider any mitigation at all for Project startup emissions. As discussed in Comments XI and XIII below, the Revised DEIR must require offsets to mitigate construction emissions that will significantly impact onshore air quality. If construction impacts were mitigated with emission reductions, the Revised DEIR could also require the construction offsets to remain in effect until startup is complete. This would ensure that no net emission increases would occur that will interfere with the progress towards attaining the NAAQS for ozone.

IX. Project Emissions from Higher BTU Gas were not Included

Re: Section 4.6.2 Regulatory Setting

The Revised DEIR briefly addresses the issue of increased regional NO_x emissions that could be caused by higher BTU gas supplied through the proposed LNG terminal (Revised DEIR, p. 4.6-24). This “hotter” gas results from higher concentrations of C2-C4 hydrocarbons (ethane, propane, and butane) in the natural gas itself (which is mainly comprised of methane). Higher BTU gas results in increased combustion temperatures, and therefore potentially greater NO_x emissions, as compared to gas meeting current CARB specifications for compressed natural gas as motor vehicle fuel.⁴¹ Increased NO_x emissions could result from stationary, mobile, and area source use of this potentially higher BTU gas.

³⁹ 42.3 tons/60 days * 2000 lbs/ton = 1,410 lbs/day.

⁴⁰ SCAQMD Air Quality Significance Thresholds, Rev. January 2006.

⁴¹ Letter from Tom Murphy, Santa Barbara County APCD to Lt. Ken Kusano, U.S. Coast Guard and Mr. Cy Oggins, California State Lands Commission, February 25, 2005.

The SCAQMD also addresses the increased emissions resulting from combusting higher heating value gas. As presented in the Revised DEIR, such use in stationary source non-residential natural gas-fired equipment could increase NO_x emissions by over 20 percent (Revised DEIR, p. 4.6-24). By not addressing this concern, the veracity of the Revised DEIR is in question. This is a potentially major source of NO_x emissions that have not been incorporated into the area ozone nonattainment plans for areas that would receive the Cabrillo Port gas. If there are no conditions limiting the BTU content of the gas to be delivered by BHP Billiton, then the Revised DEIR must analyze the significant impacts that will likely occur from the area-wide use of higher heating value gas. This is particularly important should higher heating value gas from locations other than Scarborough Field (such as Indonesia) be delivered through Cabrillo Port (Revised DEIR, p. 2-15). The Revised DEIR must identify all possible locations where Project gas could be obtained, then calculate the resultant area-wide emissions and impacts caused by distributing and using the gas from each source field, and require appropriate emission offsets.

X. Emissions from the FSRU, Associated Marine Vessels, and Offshore/Onshore Construction Will Adversely Impact Onshore Air Quality

Re: Section 4.6.4 Impact Analysis and Mitigation

The Revised DEIR addresses emissions and impacts of ozone precursor emissions (NO_x and ROC) from the Project sources. The construction emissions onshore and in State waters are discussed in Impact AIR-I; since no offsets are identified (and none are offered by BHP Billiton for Ventura County), these emissions are listed as significant Class I impacts. The FSRU emissions are discussed in Impact AIR-4, and are found to be mitigatable Class II impacts. The Marine Vessel Emissions in California Coastal Waters are presented in Impact AIR-5, and are listed as Class I impacts, because BHP Billiton has not yet resolved how they will offset these Project emissions.⁴² And the offshore construction emissions in Federal waters are discussed in Impact AIR-6; these are listed as insignificant Class III impacts not requiring mitigation at all.

All of the Project offshore emissions must be subject to the same mitigation requirements – all of these emissions will impact the onshore nonattainment areas for ozone. The Revised DEIR is inherently flawed in that it divides the Project emissions into several categories, even though from an air impact standpoint they are inseparable. Most notably, there is no reason at all to disconnect the ozone precursor emissions from the FSRU apart from the associated Project marine vessel emissions. By dividing the emissions among several impact classifications, the Revised DEIR is piecemealing the mitigation requirements, and is undermining the need to offset all offshore Project emissions. Separating the offshore emissions into three impact groups ignores the many thoroughly-documented meteorological analyses verifying that all offshore emissions will come onshore and impact mainland air quality.

Ventura County and Los Angeles County are nonattainment for Federal and State ozone standards. The primary regulatory tool for achieving reasonable further progress towards attaining the NAAQS

⁴² The Revised DEIR has not considered all marine vessel emissions in California Coastal Waters; they only addressed emissions within 25 NM of shore.

for ozone is to require the project applicant to obtain “offsets” of the project emissions. For example, for sources that have the potential to emit 25 tons or more per year of NO_x or VOC, VCAPCD Rule 26 requires offsets at a ratio of 1.3:1, and the offsets must meet specific requirements specified in this Rule.⁴³ Similarly, SCAQMD New Source Review Regulation XIII requires offset ratios of 1.0:1 to 1.2:1 for emissions of any nonattainment air contaminant.⁴⁴

The Revised DEIR calculates 231.3 tons/year of project NO_x emissions from the FSRU and marine vessels (Revised DEIR, Appendix G2). Accordingly, VCAPCD Rule 26 would require over 300 tons/year of regulatory-approved NO_x offsets, after applying the 1.3:1 offset ratio (multiplier). This approach is necessary to make reasonable further progress towards attaining the ozone NAAQS in Ventura County. If impacts are not mitigated consistent with VCAPCD Rule 26, just the opposite effect would occur: attainment of the ozone NAAQS would be delayed, or perhaps made impossible, and the public health impacts from breathing such air would be extended. In Southern California, with over 30 years of experience in ozone transport analysis, photochemical modeling, and control measure experience, an exemption for a source of 231.3 tons/year NO_x emissions would be unthinkable.

In Table 4.6-15, the Revised DEIR reports: “Based on an analysis of the Deepwater Port Act and VCAPCD rules, the USEPA concluded that Rule 26 does not apply to the FSRU and that emission offsets are not required for Project sources constructed in the area where the FSRU is proposed to be sited.” (Revised DEIR, p.4.6-21.) This is a very significant shortcoming in the environmental analysis, one which may exempt all of the Project operational emissions from any meaningful and binding offsets under the Clean Air Act. The SLC, however, cannot rely on such exemptions under CEQA. Significant air quality impacts must be mitigated to the maximum extent feasible.

The “reasoning” behind the Project exemption for offsets lies in the USEPA determination that the Project is located in an attainment area for ozone (Anacapa Island), and therefore is not subject to VCAPCD Rule 26. This finding ignores three key facts:

- The offshore emissions from the Project will negatively impact onshore air quality and must be mitigated (see Comment III above);
- The attainment status determination for Anacapa Island is completely without merit;
- The Project is much closer to the onshore portions of the VCAPCD and the SCAQMD.

To compound this error even further, the Revised DEIR uses a similarly flawed logic for finding that Project construction emissions in Federal waters will be insignificant (see Comment XIII below). Dividing the single-owner Project emissions into several jurisdictional regions, each with its own separate and unequal significance threshold, defeats the main purpose of the Revised DEIR: To ensure that significant environmental impacts are properly considered and mitigated.

⁴³ VCAPCD Rule 26.2.

⁴⁴ SCAQMD Rule 1303 (b)(2).

XI. The Revised DEIR Does Not Adequately Mitigate Construction Emissions in Either the VCAPCD or SCAQMD

Re: Section 4.6.4 Impact Analysis and Mitigation

Identified as Impact AIR-1, the Revised DEIR finds that “Project construction activities in Ventura and Los Angeles Counties would generate emissions that exceed quantitative thresholds for ozone precursors NO_x and ROCs, and CO.” (Revised DEIR, p. 4.6-25). The calculated Project construction emissions and the corresponding VCAPCD and SCAQMD significance thresholds are presented in the following tables (from Revised DEIR, p. 4.6-26):

	Daily Emissions (pounds/day)			Quarterly Emissions (tons/quarter)		
	CO	NO _x	ROCs	CO	NO _x	ROCs
<u>Ventura County</u>						
Offshore Pipeline Installation	n/a	5,726	830	n/a	n/a	n/a
Shore Crossing Construction	n/a	1,323	191	n/a	n/a	n/a
Worker Commuting	n/a	7	4	n/a	n/a	n/a
Subtotal	n/a	7,056	1,025	n/a	n/a	n/a
Onshore Pipeline Installation						
Trenching	n/a	276	43	n/a	n/a	n/a
Pipelaying	n/a	237	60	n/a	n/a	n/a
Boring	n/a	368	53	n/a	n/a	n/a
Worker Commuting	n/a	4	2	n/a	n/a	n/a
Subtotal	n/a	885	158	n/a	n/a	n/a
VCAPCD Threshold for Mitigation	n/a	25	25	n/a	n/a	n/a

	Daily Emissions (pounds/day)			Quarterly Emissions (tons/quarter)		
	CO	NO _x	ROCs	CO	NO _x	ROCs
<u>Los Angeles County</u>						
Onshore Pipeline Installation						
Trenching	413	276	43	6.2	4.1	0.65
Pipelaying	1,123	237	60	14.3	2.9	0.75
HDD	1,060	865	125	7.9	6.5	0.95
Worker Commuting	51	4	2	3.1	0.2	0.1
Subtotal	2,647	1,382	230	31.5	13.7	2.5
SCAQMD Significance Threshold	550	100	75	24.75	2.5	2.5

The Revised DEIR identifies that “Pursuant to the General Conformity Rule, the Applicant proposes to fully offset annual NO_x emissions generated from construction activities in Los Angeles County.” (Revised DEIR, p. 4.6-27). The DEIR is correct in noting that the annual offsets for construction emissions in Los Angeles County (27.4 tons/year NO_x) are not anticipated to decrease the daily emissions to less than the SCAQMD significance criterion of 100 pounds/day. The Revised DEIR identifies this as a Class I air impact, which will require a statement of overriding consideration from the SLC, or the Project could not go forward.

It is difficult to imagine, though, what the basis could be for a statement of overriding consideration. In the case of Ventura County, the Revised DEIR doesn’t even have the Draft Conformity Determination to offer as a rationale for mitigation, as this document (incorrectly) finds that the construction emissions in Ventura County conform to the ozone nonattainment SIP and won’t require offsets. And BHP Billiton isn’t offering any construction offsets in Ventura County, either

on an annual or a daily basis. Given this second layer of nonexistent mitigation, the decision maker has no justification for issuing a statement of overriding consideration for this significant air impact.

The Revised DEIR offers MM AIR-1a as a mitigation measure for limiting net emission increases of construction emissions in State waters and onshore Ventura and Los Angeles Counties (Revised DEIR, p. 4.6-27). This mitigation measure includes a condition that “the Applicant shall prepare a Construction Emissions Reduction Plan and work with the VCAPCD and SCAQMD to implement specific measures contained in the plan.” This plan should also contain a construction emissions and activity tracking system, so that it can be verified that the Project emissions do not exceed the levels identified in the Revised DEIR. Of course, this Construction Emissions Reduction Plan and the other requirements of MM AIR-1a are meaningless until the Applicant has offset their emissions liability to levels below the VCAPCD and SCAQMD significance thresholds.

XII. The FSRU and Associated Marine Vessel Emissions Are Incorrectly Divided into two Separate Air Impact Findings

Re: Section 4.6.4 Impact Analysis and Mitigation

The Revised DEIR calculates that 231.3 tons/year of NO_x emissions will be emitted by the FSRU and associated marine vessels (Revised DEIR, Appendix G2). For purposes of impact consideration and mitigation, however, the Revised DEIR divides these Project emissions into two separate categories. There is no explanation or justification provided for this piecemeal approach, other than BHP Billiton’s undocumented offer to provide emission reductions for only the FSRU NO_x emissions.

The FSRU emissions are discussed in Impact AIR-4, and are listed as Class II impacts. The Revised DEIR notes in Applicant mitigation measure AM AIR-4a that BHP Billiton has committed to provide emission reductions “by an amount up to the FSRU’s annual NO_x emissions.” (Revised DEIR, p. 4.6-33). The Marine Vessel Emissions in California Coastal Waters are presented in Impact AIR-5, and are listed as Class I impacts, because BHP Billiton has not yet resolved how they will offset these Project emissions.⁴⁵

There is no air quality basis for separating the FSRU from the marine vessel emissions – these are all part of the same pool of Project emissions that will significantly affect onshore air quality. Because of the inseparable nature of these air releases, the Revised DEIR must consider the combined total Project emissions in establishing mitigation requirements.

In the first place, the total Project operational NO_x and ROC emissions should have been subject to the verifiable and binding offsets required in VCAPCD Rule 26. The USEPA has given a favorable recommendation (for the applicant) that sidesteps this obvious and straight-forward approach, mainly by attaching the Project to a flawed attainment determination for Anacapa Island. This results in the watered-down consideration of Applicant-identified emission reductions, rather than the stricter

⁴⁵ The Revised DEIR has not considered all marine vessel emissions in California Coastal Waters; they only addressed emissions within 25 NM of shore.

offset requirements of VCAPCD Rule 26. To make matters worse, the Revised DEIR continues to tangle this web by then dividing the Project into two separate components, each with its own impact consideration and emission reduction mitigation.

Rather than the convoluted and piecemeal approach to considering and mitigating emissions, the Revised DEIR must subject the entire Project emissions to an offset program consistent with VCAPCD Rule 26. This would require over 300 tons/year of regulatory-approved NO_x offsets (after applying the 1.3:1 offset ratio), and is the only reasonable approach to mitigating Project NO_x emissions to insignificance.

On a 24-hour basis, the Project operational emissions equal about 1,267 pounds of NO_x per day.⁴⁶ The significance threshold for operational NO_x emissions in the VCAPCD is 25 lbs/day (Revised DEIR, Table 4.6-16). The Project operational emissions exceed this significance threshold by a factor of 50.6. The significance threshold for operational NO_x emissions in the SCAQMD is 55 lbs/day.⁴⁷ The Project operational emissions exceed this significance threshold by a factor of 23.0. The Project operational emissions greatly exceed the significance thresholds established by either the VCAPCD or SCAQMD, and will require mitigation to the maximum extent feasible.

XIII. Project Construction Emissions in Federal Waters Significantly Impact Onshore Air Quality and Must be Mitigated

Re: Section 4.6.4 Impact Analysis and Mitigation

As discussed in Comments III, IV, and X above, all offshore emissions, whether construction or operation, will significantly impact onshore air quality. The Revised DEIR, however, finds that Project construction emissions in Federal waters will cause insignificant air impacts – Class III – with no mitigation required. This finding (Impact AIR-6) is flawed in several key ways.

The Revised DEIR develops this finding of insignificance via an irrelevant and biased emission comparison analysis. In Table 4.6-19 of the Revised DEIR, the offshore construction NO_x emissions are listed as ranging from 2.2 to 2.9 tons per day, or roughly 4,400 to 5,800 pounds of NO_x per day. These daily emissions are compared to emission forecasts for all of the offshore emissions for Ventura County and the South Coast Air Basin (69.1 tons/day), and the emission forecasts for all sources both onshore and offshore for Ventura County and the South Coast Air Basin (831.8 tons/day) (Revised DEIR, p. 4.6-36).

The Revised DEIR concludes: “This comparison suggests that Project construction emissions in Federal waters would represent a moderate fraction of anticipated regional offshore emission but only a small fraction of overall regional emissions” (Revised DEIR, p. 4.6-36). This conclusion is wrong on several levels. The Revised DEIR does not even identify the criteria they are using to determine what constitutes moderate and “only a small fraction.” If, on the other hand, the Revised DEIR used the same criteria as it did for Impact AIR-1 (construction emissions within the VCAPCD

⁴⁶ 231.3 tons/365 days * 2000 lbs/ton = 1,267 lbs/day.

⁴⁷ SCAQMD Air Quality Significance Thresholds, Rev. January 2006.

and SCAQMD), the construction emissions in Federal waters would exceed the VCAPCD threshold for significance by a factor of 176 to 232. For the SCAQMD, the construction emissions in Federal waters would exceed the threshold for significance by a factor of 44 to 58. Based on meteorological conditions in the Project area, there is no reason to assume that the same emissions in Federal waters would result in less significant impacts to onshore air quality than would State water emissions.

Also, the comparison of Project emissions to that forecast for the entire regional offshore and onshore areas is inappropriate. Given this criterion virtually no new emission source would be deemed significant, because no new project could possibly be on the scale of the existing air emissions from a region exceeding the area of the South Coast Air Basin. This mass comparison method is never used by the VCAPCD or SCAQMD in determining significance; instead they rely on a simple emission threshold. And even though the construction emissions are anticipated to occur for about 60 days (if all goes according to plan), it is important to remember that the ozone standards are for periods of from one hour (for the CAAQS) to eight hours (for the NAAQS). The daily construction emissions in Federal waters are extremely high when viewed in the same timeframe as these ozone standards. In essence, the emissions that occur during the same averaging periods as the ozone standards are what really matter. It is for this reason that the VCAPCD and SCAQMD construction significance thresholds are only 25 and 100 pounds/day, respectively.

The Revised DEIR also promotes that construction emissions are not expected to occur during May through October, "which is the period of historical high ozone concentrations for the region." (Revised DEIR, p. 4.6-36). This in itself is not mitigation, as there is no guarantee or produced evidence that conditions conducive to high ozone formation will not occur from November through April. Further, scheduling constraints, project delays, and other outside factors (such as marine mammal migrations during winter and early spring) could interfere with the timing of construction activities in Federal waters. Even the Revised DEIR is not entirely certain on this issue, stating that "Federal water construction emissions" are not expected to occur during May through October."

Project construction emissions in Federal waters will significantly impact onshore air quality and should be considered and mitigated using the same criteria as construction emissions in State waters. The Revised DEIR has incorrectly identified these emissions as being Class III insignificant impacts.

XIV. Conclusion

The Revised DEIR is inadequate in identifying, considering, and mitigating air quality impacts; the document must be corrected and recirculated. First, the full scope of Project emissions must be identified in the DEIR, using data, calculations, and analyses that adequately characterize the entire Project liability. And second, rather than assess the Project using significance criteria for several separate and adjacent attainment/nonattainment planning areas, the SLC must evaluate all Project emissions as significantly contributing to the onshore ozone nonattainment problem for Ventura and Los Angeles counties. Accordingly, all operational, construction, marine vessel, and other associated emissions must be evaluated and mitigated with verifiable offsets greater than or equal to the total Project emissions liability. Only then can the Revised DEIR adequately verify that the Project emissions have been mitigated to insignificance.

Thank you for the opportunity to comment on the Revised DEIR.

Sincerely,

A handwritten signature in cursive script that reads "Camille Sears".

Camille Sears

Attachments

Summary

I have 25 years of regulatory and private-sector experience in air quality impact analyses, health risk assessments, meteorological monitoring, and geographic information systems. I specialize in litigation support; I have successfully provided testimony in numerous cases, both as an individual consultant and as part of a team of experts.

Education

- M.S., Atmospheric Science, University of California, Davis, 1980.
- B.S., Atmospheric Science, University of California, Davis, 1978.

Air Dispersion Modeling

- I am experienced in applying many different air dispersion models, including programs still in the development phase. I have prepared well over 1,000 air dispersion modeling analyses requiring the use of on-site or site-specific meteorological data. These runs were made with the USEPA ISC, OCD, MESOPUFF, INPUFF, CALPUFF, ISC-PRIME, AERMOD, COMPLEX-I, MPTER, and other air dispersion models.
- I prepared and submitted technical comments to the USEPA on beta-testing versions of AERMOD; these comments are being addressed and will be incorporated into the model and instructions when it is ready for regulatory application.
- I am experienced in performing air dispersion modeling for virtually every emission source type imaginable. I have modeled:
 - Refineries and associated activities;
 - Mobile sources, including cars, trains, airplanes, trucks, and ships;
 - Power plants, including natural gas and coal-fired;
 - Smelting operations;
 - Area sources, such as housing tracts, biocides from agricultural operations, landfills, airports, oil and gas seeps, and ponds;
 - Volume sources, including fugitive emissions from buildings and diesel construction combustion emissions;
 - Small sources, including dry cleaners, gas stations, surface coating operations, plating facilities, medical device manufacturers, coffee roasters, ethylene oxide sterilizers, degreasing operations, foundries, and printing companies;
 - Cooling towers and gas compressors;
 - Diatomaceous earth, rock and gravel plants, and other mining operations;
 - Offshore oil platforms, drilling rigs, and processing activities;
 - Onshore oil and gas exploration, storage, processing, and transport facilities;
 - Fugitive dust emissions from roads, wind erosion, and farming activities;
 - Radionuclide emissions from actual and potential releases.
- I have extensive experience in modeling plume depletion and deposition from air releases of particulate emissions.
- As a senior scientist, I developed the Santa Barbara County Air Pollution Control District (SBAPCD) protocol on air quality modeling. I developed extensive modeling capabilities for the SBAPCD on VAX 8600 and Intel I-860 computer systems; I acted as systems analyst for the SBAPCD air quality modeling system; I served as director of air quality analyses for numerous major energy projects; I performed air quality impact analyses using inert and photochemical models, including EPA, ARB and private-sector models; I performed technical review and evaluating air quality and wind field models; I developed software to prepare model inputs consistent with the SBAPCD protocol on air quality modeling for OCD, OCDCPM, MPTER, COMPLEX-I/II and ISC.
- I provided detailed review and comments on the development of the Minerals Management Service OCD model. I developed the technical requirements for and

supervised the development of the OCDCPM model, a hybrid of the OCD, COMPLEX-I and MPTER models.

- I prepared the "Modeling Exposures of Hazardous Materials Released During Transportation Incidents" report for the California Office of Environmental Health Hazard Assessment (OEHHA). This report examines and rates the ADAM, ALOHA, ARCHIE, CASRAM, DEGADIS, HGSYSTEM, SLAB, and TSCREEN models for transportation accident consequence analyses of a priority list of 50 chemicals chosen by OEHHA. The report includes a model selection guide for adequacy of assessing priority chemicals, averaging time capabilities, isopleth generating capabilities, model limitations and concerns, and model advantages.
- I am experienced in assessing uncertainty in emission rate calculations, source release, and dispersion modeling. I have developed numerous probability distributions for input to Monte Carlo simulations, and I was a member of the External Advisory Group for the California EPA Air Toxics Hot Spots Program Risk Assessment Guidelines, Part IV, Technical Support Document for Exposure Assessment and Stochastic Analysis.

Health Risk Assessment

- I have prepared more than 300 health risk assessments of major air toxics sources. These assessments were prepared for AB 2588 (the Air Toxics "Hot Spots" Information and Assessment Act of 1987), Proposition 65, and other exposure analysis activities. More than 120 of these exposure assessments were prepared for Proposition 65 compliance verification in a litigation support setting.
- I reviewed approximately 300 other health risk assessments of toxic air pollution sources in California. The regulatory programs in this review include AB 2588, Proposition 65, the California Environmental Quality Act, and other exposure analysis activities. My clients include the California Attorney General's Office, the Los Angeles County District Attorney's Office, the SBAPCD, the South Coast Air Quality Management District, numerous environmental and community groups, and several plaintiff law firms.
- I am experienced in assessing public health risk from continuous, intermittent, and accidental releases of toxic emissions. I am experienced in generating graphical presentations of risk results, and characterizing risks from carcinogenic and acute and chronic noncarcinogenic pollutants.
- I am experienced in communicating adverse health risks discovered through the Proposition 65 and AB 2588 processes. I have presented risk assessment results in many public settings -- to industry, media, and the affected public.
- For four years, I was the Air Toxics Program Coordinator for the SBAPCD. My duties included: developing and managing the District air toxics program; supervising District staff assigned to the air toxics program; developing District air toxics rules, regulations, policies and procedures; management of all District air toxics efforts, including AB 2588, Proposition 65, and federal activities; developing and tracking the SBAPCD air toxics budget.
- I have prepared numerous calculations of exposures from indoor air pollutants. A few examples include: diesel PM₁₀ inside school buses, formaldehyde inside temporary school buildings, lead from disturbed paint, phenyl mercuric acetate from water-based paints and drywall mud, and tetrachloroethene from recently dry-cleaned clothes.

Litigation Support

- I have prepared numerous analyses in support of litigation, both in Federal and State Courts. I am experienced in preparing F.R.C.P. Rule 26(a)(2) expert reports and providing deposition and trial testimony (I have prepared eight Rule 26 reports). Much of my work is focused on human dose and risk reconstruction resulting from multiple air emission sources (lifetime and specific events).

- I am experienced in preparing declarations (many dozens) and providing expert testimony in depositions and trials (see my testimony history).
- I am experienced in providing support for legal staff. I have assisted in preparing numerous interrogatories, questions for depositions, deposition reviews, various briefs and motions, and general consulting.
- Recent examples of my work include:

DTSC v. Interstate Non-Ferrous; United States District Court, Eastern District of California (2002).

In this case I performed air dispersion modeling, downwind soil deposition calculations, and resultant soil concentrations of dioxins (TCDD TEQ) from historical fires at a smelting facility. I prepared several Rule 26 Reports in my role of assisting the California Attorney General's Office in trying this matter.

Akee v. Dow et al.; United States District Court, District of Hawaii (2003-2004).

In this case I performed air dispersion modeling used to quantify air concentrations and reconstruct intake, dose, excess cancer risk, and noncancer chronic hazard indices resulting from soil fumigation activities on the island of Oahu, Hawaii. I modeled 319 separate AREAPOLY pineapple fields for the following chemicals: DBCP, EDB, 1,3-trichloropropene, 1,2-dichloropropane, and epichlorohydrin. I calculated chemical flux rates and modeled the emissions from these fumigants for years 1946 through 2001 (56 years) for 34 test plaintiffs and 97 distinct home, school, and work addresses. I prepared a Rule 26 Expert Report, successfully defended against Daubert challenges, and testified in trial.

Lawrence O'Connor v. Boeing North America, Inc., United States District Court, Central District of California, Western Division (2004-2005).

In this case I performed air dispersion modeling, quantified air concentrations, and reconstructed individual intake, dose, and excess cancer risks resulting from approximately 150 air toxics sources in Los Angeles and Ventura Counties, California. I prepared these analyses for years 1950 through 2000 (51 years) for 173 plaintiffs and 741 distinct home, school, and work addresses. I prepared several Rule 26 Reports, and the case settled on the eve of trial in September, 2005. Defendants did not attempt a Daubert challenge of my work.

- I have prepared hundreds of individual and region-wide health risk assessments in support of litigation. These analyses include specific sub-tasks, including: calculating emission rates, choosing proper meteorological data inputs, performing air dispersion modeling, and quantifying intake, dose, excess cancer risk, and acute/chronic noncancer health effects.
- I have prepared over 120 exposure assessments for Proposition 65 litigation support. In these analyses, my tasks include: reviewing AB 2588 risk assessments and other documents to assist in verifying compliance with Proposition 65; preparing exposure assessments consistent with Proposition 65 Regulations for carcinogens and reproductive toxicants; using a geographic information system (Atlas GIS) to prepare exposure maps that display areas of required warnings; calculating the number of residents and workers exposed to levels of risk requiring warnings (using the GIS); preparing declarations, providing staff support, and other expert services as required. I have also reviewed scores of other assessments for verifying compliance with Proposition 65. My proposition 65 litigation clients include the California Attorney General's Office, the Los Angeles County District Attorney's Office, As You Sow, California Community Health Advocates, Center for Environmental Health, California Earth Corps, Communities for a Better Environment, Environmental Defense Fund, Environmental Law Foundation, and People United for a Better Oakland.

Geographic Information Systems

- **ArcGIS:** I am experienced in preparing presentation and testimony maps using ArcView. I developed methods to convert AutoCAD DXF files to ArcView polygon theme shape files for use in map overlays.

- I have created many presentation maps with ArcView using MrSID DOQQ and other aerial photos as a base and then overlaying exposure regions. This provides a detailed view (down to the house level) of where air concentrations and health risks are projected to occur.
- Using ArcView, I have created numerous presentations using USGS Topographic maps (as TIFF files) as the base on to which exposure regions are overlaid.
- MapInfo for Windows: I prepared numerous presentation maps including exposure isopleths, streets and highways, and sensitive receptors, labels. I developed procedures for importing Surfer isopleths in AutoCAD DXF format as a layer into MapInfo.
- Atlas GIS: I am experienced in preparing presentation maps with both the Windows and DOS versions of Atlas GIS. In addition to preparing maps, I use Atlas GIS to aggregate census data (at the block group level) within exposure isopleths to determine the number of individuals living and working within exposure zones. I am also experienced in geocoding large numbers of addresses and performing statistical analyses of exposed populations.
- I am experienced in preparing large-scale graphical displays, both in hard-copy and for PowerPoint presentations. These displays are used in trial testimony, public meetings, and other litigation support.
- I developed a Fortran program to modify AutoCAD DXF files, including batch-mode coordinate shifting for aligning overlays to different base maps.

Ozone and Long-Range Transport

- I developed emission reduction strategies and identified appropriate offset sources to mitigate project emissions liability. For VOC offsets, I developed and implemented procedures to account for reactivity of organic compound species for ozone impact mitigation. I wrote Fortran programs and developed a chemical database to calculate ozone formation potential using hydroxyl radical rate constants and an alkane/non-alkane reactive organic compound method.
- I provided technical support to the Joint Interagency Modeling Study and South Central Coast Cooperative Aerometric Monitoring Program. With the SBAPCD, I provided technical comments on analyses performed with the EKMA, AIRSHED, and PARIS models. I was responsible for developing emissions inventory for input into regional air quality planning models.
- I was the project manager for the Santa Barbara County Air Quality Attainment Plan Environmental Impact Report (EIR). My duties included: preparing initial study; preparation and release of the EIR Notice of Preparation; conducting public scoping hearings to obtain comments on the initial study; managing contractor efforts to prepare the draft EIR.
- I modified, tested, and compiled the Fortran code to the MESOPUFF model (the precursor to CALPUFF) to incorporate critical dividing streamline height algorithms. The model was then applied as part of a PSD analysis for a large copper-smelting facility.
- I am experienced in developing and analyzing wind fields for use in long-range transport and dispersion modeling.
- I have run CALPUFF numerous times. I use CALPUFF to assess visibility effects and both near-field and mesoscale air concentrations from various emission sources, including power plants.

Emission Rate Calculation

- I developed methods to estimate and verify source emission rates using air pollution measurements collected downwind of the emitting facility, local meteorological data, and dispersion models. This technique is useful in determining whether reported source emission rates are reasonable, and based on monitored and modeled air concentrations, revised emission rates can be created.

- I am experienced in developing emission inventories of hundreds of criteria and toxic air pollutant sources. I developed procedures and programs for quantifying emissions from many air emission sources, including: landfills, diesel exhaust sources, natural gas combustion activities, fugitive hydrocarbons from oil and gas facilities, dry cleaners, auto body shops, and ethylene oxide sterilizers.
- I have calculated flux rates (and modeled air concentrations) from hundreds of biocide applications to agricultural fields. Emission sources include aerial spraying, boom applications, and soil injection of fumigants.
- I am experienced in calculating emission rates using emission factors, source-test results, mass-balance equations, and other emission estimating techniques.

Software Development

- I am skilled in computer operation and programming, with an emphasis on Fortran 95.
- I am experienced with numerous USEPA dispersion models, modifying them for system-specific input and output, and compiling the code for personal use and distribution. I own and am experienced in using the following Fortran compilers: Lahey Fortran 95, Lahey Fortran 90 DOS-Extended; Lahey F77L-EM32 DOS-Extended; Microsoft PowerStation 32-bit DOS-Extended; and Microsoft 16-bit.
- I configured and operated an Intel I-860 based workstation for the SBAPCD toxics program. I created control files and recoded programs to run dispersion models and risk assessments in the 64-bit I-860 environment (using Portland Group Fortran).
- Using Microsoft Fortran PowerStation, I wrote programs to extract terrain elevations from both 10-meter and 30-meter USGS DEM files. Using a file of discrete x,y coordinates, these programs extract elevations within a user-chosen distance for each x,y pair. The code I wrote can be run in steps or batch mode, allowing numerous DEM files to be processed at once.
- I have written many hundreds of utilities to facilitate data processing, entry, and quality assurance. These utility programs are a "tool chest" from which I can draw upon to expedite my work.
- While at the SBAPCD, I designed the ACE2588 model - the first public domain multi-source, multi-pathway, multi-pollutant risk assessment model. I co-developed the structure of the ACE2588 input and output files, supervised the coding of the model, tested the model for quality assurance, and for over 10 years I provided technical support to about 200 users of the model. I was responsible for updating the model each year and ensuring that it is consistent with California Air Pollution Control Officer's Association (CAPCOA) Risk Assessment Guidelines.
- I developed and coded the ISC2ACE and ACE2 programs for distribution by CAPCOA. These programs were widely used in California for preparing AB 2588 and other program health risk assessments. ISC2ACE and ACE2 contain "compression" algorithms to reduce the hard drive and RAM requirements compared to ISCST2/ACE2588. I also developed ISC3ACE/ACE3 to incorporate the revised ISCST3 dispersion model requirements.
- I developed and coded the "HotSpot" system - a series of Fortran programs to expedite the review of air toxics emissions data, to prepare air quality modeling and risk assessment inputs, and to prepare graphical risk presentations.
- I customized ACE2588 and developed a mapping system for the SBAPCD. I modified the ACE2588 Fortran code to run on an Intel I-860 RISC workstation; I updated programs that allow SBAPCD staff to continue to use the "HotSpot" system - a series of programs that streamline preparing AB 2588 risk assessments; I developed a risk assessment mapping system based on MapInfo for Windows which linked the MapInfo mapping package to the "HotSpot" system.
- I developed software for electronic submittal of all AB 2588 reporting requirements for the SBAPCD. As an update to the "HotSpot" system software, I created software that allows facilities to submit all AB 2588 reporting data, including that needed for risk prioritization, exposure assessment, and presentation mapping. The data submitted

by the facility is then reformatted to both ATDIF and ATEDS formats for transmittal to the California Air Resources Board.

- I developed and coded Fortran programs for AB 2588 risk prioritization; both batch and interactive versions of the program were created. These programs were used by several air pollution control districts in California.

Air Quality and Meteorological Monitoring

- I was responsible for the design, review, and evaluation of an offshore source tracer gas study. This project used both inert tracer gas and a visible release to track the onshore trajectory and terrain impact of offshore-released buoyant plumes.
- I developed the technical requirements for the Santa Barbara County Air Quality/Meteorological Monitoring Protocol. I developed and implemented the protocol for siting pre- and post-construction air quality and meteorological PSD monitoring systems. I determined the instrumentation requirements, and designed and sited over 30 such PSD monitoring systems. Meteorological parameters measured included ambient temperature, wind speed, wind direction, sigma-theta (standard deviation of horizontal wind direction fluctuations), sigma-phi (standard deviation of vertical wind direction fluctuations), sigma-v (standard deviation of horizontal wind speed fluctuations), and sigma-w (standard deviation of vertical wind speed fluctuations). Air pollutants measured included PM₁₀, SO₂, NO, NO_x, NO₂, CO, O₃, and H₂S.
- I was responsible for data acquisition and quality assurance for an offshore meteorological monitoring station. Parameters measured included ambient temperature (and delta-T), wind speed, wind direction, and sigma-theta.
- In coordination with consultants performing air monitoring for verifying compliance with Proposition 65 and other regulatory programs, I wrote software to convert raw meteorological data to hourly-averaged values formatted for dispersion modeling input.
- Assisting the Ventura Unified School District, I collected air, soil, and surface samples and had them analyzed for chlorpyrifos contamination (caused by spray drift from a nearby citrus orchard). I also coordinated the analysis of the samples, and presented the results in a public meeting.
- Using summa canisters, I collected numerous VOC samples to characterize background and initial conditions for use in Santa Barbara County ozone attainment modeling. I also collected samples of air toxics (such as xylenes downwind of a medical device manufacturer) to assist in enforcement actions.
- For the California Attorney General's Office, I purchased, calibrated, and operated a carbon monoxide monitoring system. I measured and reported CO air concentrations resulting from numerous types of candles, gas appliances, and charcoal briquettes.

Support, Training, and Instruction

- For 10 years, I provided ACE2588 risk assessment model support for CAPCOA. My tasks included: updating the ACE2588 risk assessment model Fortran code to increase user efficiency and to maintain consistency with the CAPCOA Risk Assessment Guidelines; modifying the Fortran code to the EPA ISC model to interface with ACE2588; writing utility programs to assist ACE2588 users; updating toxicity data files to maintain consistency with the CAPCOA Risk Assessment Guidelines; developing the distribution and installation package for ACE2588 and associated programs; providing technical support for all users of ACE2588.
- I instructed approximately 20 University Professors through the National Science Foundation Faculty Enhancement Program. Instruction topics included: dispersion modeling, meteorological data, environmental fate analysis, toxicology of air pollutants, and air toxics risk assessment; professors were also trained on the use of the ISC2ACE dispersion model and the ACE2 exposure assessment model.
- I was the instructor of the Air Pollution and Toxic Chemicals course for the University of California, Santa Barbara, Extension certificate program in Hazardous Materials Management. Topics covered in this course include: detailed review of criteria and

noncriteria air pollutants; air toxics legislation and regulations; quantifying toxic air contaminant emissions; criteria and noncriteria pollutant monitoring; air quality modeling; health risk assessment procedures; health risk management; control/mitigating air pollutants; characteristics and modeling of spills and other short-term releases of air pollutants; acid deposition, precipitation and fog; indoor/occupational air pollution; the effect of chlorofluorocarbons on the stratospheric ozone layer. I taught this course for five years.

- I have trained numerous regulatory staff on the mechanics of dispersion modeling, health risk assessments, emission rate calculations, and presentation mapping. I provided detailed training to SBAPCD staff in using the HARP program, and in comparing and contrasting ACE2588 analyses to HARP.
- Through UCSB Extension, I taught a three-day course on dispersion modeling, preparing health risk assessments, and presentation mapping with Atlas GIS and MapInfo.
- I hold a lifetime California Community College Instructor Credential (Certificate No. 14571); Subject Matter Area: Physics.
- I have presented numerous guest lectures – at universities, public libraries, farm groups, and business organizations.

Affiliations

- American Meteorological Society (former president, Ventura/Santa Barbara County Chapter).

Publications

- To establish a legal record and to assist in environmental review, I prepared and submitted dozens of detailed comment letters to regulatory and decision-making bodies.
- I have contributed to over 100 Environmental Impact Statements/Reports and other technical documents required for regulatory decision-making.
- I prepared two software review columns for the *Journal of the Air and Waste Management Association*.

Employment History

- | | |
|---|--------------|
| • Self-Employed Air Quality Consultant | 1992 to 2006 |
| • Santa Barbara County APCD, Senior Scientist | 1988 to 1992 |
| • URS Consultants, Senior Scientist | 1987 to 1988 |
| • Santa Barbara County APCD, Air Quality Engineer | 1983 to 1987 |
| • Dames and Moore, Meteorologist | 1982 to 1983 |
| • UC Davis, Research Associate | 1980 to 1981 |

Testimony History

- People of the State of California v. McGhan Medical, Inc.
Deposition: Two dates: June - July 1990
- People of the State of California v. Santa Maria Chili
Deposition: Two dates: August 1990
- California Earth Corps v. Johnson Controls, Inc.
Deposition: October 26, 1995
- Dale Anderson v. Pacific Gas & Electric
Deposition: January 4, 1996
Arbitration: January 17, 1996
- Adams v. Shell Oil Company
Deposition: July 3, 1996
Trial: August 21, 1996
Trial: August 22, 1996

- California Earth Corps v. Teledyne Battery Products
Deposition: January 17, 1997
- Marlene Hook v. Lockheed Martin Corporation
Deposition: December 15, 1997
- Lawrence O'Connor v. Boeing North America, Inc.
Deposition: May 8, 1998
- Bristow v. Tri Cal
Deposition: June 15, 1998
- Abeyta v. Pacific Refining Co.
Deposition: January 16, 1999
Arbitration: January 25, 1999
- Danny Aguayo v. Betz Laboratories, Inc.
Deposition: July 10, 2000
Deposition: July 11, 2000
- Marlene Hook v. Lockheed Martin Corporation
Deposition: September 18, 2000
Deposition: September 19, 2000
- Tressa Haddad v. Texaco
Deposition: March 9, 2001
- California DTSC v. Interstate Non-Ferrous
Deposition: April 18, 2002
- Akee v. Dow et al.
Deposition: April 16, 2003
Deposition: April 17, 2003
Deposition: January 7, 2004
Trial: January 17, 2004
Trial: January 20, 2004
- Center for Environmental Health v. Virginia Cleaners
Deposition: March 4, 2004
- Lawrence O'Connor v. Boeing North America, Inc.
United States District Court, Central District of California,
Western Division. Case No. CV 97-1554 DT (RCx)
Deposition: March 1, 2005
Deposition: March 2, 2005
Deposition: March 3, 2005
Deposition: March 15, 2005
Deposition: April 25, 2005
- Clemente Alvarez, et al, v. Western Farm Service, Inc.
Superior Court of the State of California
County of Kern, Metropolitan Division. Case No. 250 621 AEW
Deposition: April 11, 2005

Other Interests

- I have a small urban farm: CCOF-certified organic since 1997, growing tangerines, figs, cantaloupes, apricots, plums, peaches, herbs, and bamboo.
- I'm also a food and garden writer for Edible Ojai and Edible Communities.